Frames

Fire Research And Management Exchange System

2012 Annual Report

2012 Annual Report
Fire Research And Management Exchange System (FRAMES)
www.frames.gov

Project Title: Ongoing Maintenance and Development of the Fire Research and Management Exchange System (FRAMES)
Agreement: 08-JV-11221611-160
Principal Investigator University of Idaho: Eva Strand
Contact: Department of Forest, Rangeland, and Fire Sciences, University of Idaho, Moscow, ID, 83844-1135, evas@uidaho.edu

USFS RMRS Coordinator: Kristine Lee, kristinelee@fs.fed.us

Reporting Period: January 1, 2012 – December 31, 2012

Authors: Lynn Wells and Diana Olson

Table of Contents

Introduction

The close of 2012 marks the tenth anniversary of the Fire Research And Management Exchange System (FRAMES). The construction of FRAMES began in 2002 at the University of Idaho (UI) with funding support from the US Forest Service's Missoula Fire Lab in response to the need for cataloging and organizing wildland fire tools, data, and documents into a single system. Following the 1999 Joint Fire Science Program's (JFSP) conference and workshop entitled, "Crossing the Millennium: Integrating Spatial Technologies and Ecological Principles for a New Age in Fire Management" there was a clear need for managing what was described as a "deluge of data" and other information that would become increasingly available in the 21st century to wildland fire and other natural resource managers. FRAMES was proposed as a mechanism for ongoing information exchange and technology transfer between the wildland fire management and research communities.

In 2006, an interagency interim steering committee made up of representatives who had invested in FRAMES formed to determine next steps. With support from the US Forest Service and US Geological Survey's Core Science Analytics and Synthesis Program (USGS / CSAS), the Keystone Center facilitated the development of the FRAMES Strategic Plan (2007-2012), which emerged from over 100 telephone interviews and an online survey of fire and natural resource professionals.

The broad vision described in the strategic plan focuses on developing a national wildland fire informatics system and clearinghouse that organizes, synthesizes, evaluates, distributes, tracks use, and measures the efficacy of wildland fire and fire-related information and technological resources[1]. To implement this vision, the FRAMES mission is to support wildland fire and natural resource professionals and policymakers by promoting and facilitating information and technology sharing, exchange, collaboration, and development through a state-of-the-art web-based content management system and resource cataloging system. The use of FRAMES information technologies is intended to help eliminate redundancy, reduce costs, and promote increased productivity and efficiency for the professionals responsible for wildland fire and fire- related research and management.

In 2008, along with continued support from USGS / CSAS, the Wildland Fire Science Partnership (WFSP) was formed among the US Forest Service's Rocky Mountain Research Station (RMRS), the UI, and the University of Montana (UM). The WFSP brings together programs established at each of the three partner institutions including FRAMES and the Wildland Fire Program (UI); the National Center for Landscape Fire Analysis (UM); the Missoula Fire Sciences Laboratory's Fire, Fuel & Smoke Science Program (RMRS); and the Wildland Fire Management Research, Development, & Application (RD&A) Program (RMRS). This University - Forest Service partnership was created to "improve the management of wildland fire by integrating science,

technology, education, and practical experience[2]." The stated goals of the partnership are to:

- Increase core fire and fuel science and measurement capabilities for the improvement of resource management and fire planning.
- Produce timely, reliable, and consistent fire and fuel information for resource managers to assess and implement decisions at a landscape scale.
- Increase access to critical data and applications to support documentation, implementation, and review of decisions and accomplishments.
- Develop the skills and capabilities of future fire managers by providing experiential education, research opportunities, access to relevant science data, applications, and training[3].

The WFSP merges capabilities and capacities across state and federal agencies and unites them in a common cause. FRAMES contributes to the partnership by providing the technological capacity and resources for the WFSP to web-deliver the products that are stated in the WFSP Charter. FRAMES benefits from the collective knowledge, content, and stability that the partnership provides. Another significant milestone for FRAMES has been the move to integrate FRAMES with the National Interagency Fuels Technology Transfer (NIFTT) program. NIFTT's mission is to assist land managers in the implementation of effective fuels, fire, and vegetation management technology for addressing risks to severe fire behavior & fire effects to restore healthy ecological systems. The current focus is upon online training. FRAMES and the UI Wildland Fire Program are uniquely qualified to expand online training for wildland fire and other natural resource professionals. Together with the RMRS Wildland Fire Management RD&A Program, FRAMES and NIFTT can further help provide a bridge between wildland fire research and management communities and make sure that the best science is available for managers to make decisions.

At the beginning of 2012 the FRAMES portal was still delivered through a licensing agreement between USGS / CSAS (formerly the USGS National Biological Information Infrastructure [NBII] Program) and Oracle as it had been for several years. The Oracle portal served USGS / CSAS, FRAMES, and others. Due to the shutdown of the NBII domain on January 15, 2012 (detailed in the Infrastructure section later in this report) and the expiration of the Oracle license in December 2012, during late 2011 FRAMES began the migration from the Oracle portal platform to the new concrete5 content management system implemented on servers located at UI. The concrete5 content management system is a powerful, flexible, easy to use, object oriented open source system with a number of add-ons available for customized design. FRAMES now relies on Information Technology resources and support from UI through the new Northwest Knowledge Network (NKN) program (www.northwestknowledge.net). FRAMES worked with NKN staff to facilitate a migration from USGS servers at the Federal Center in Denver to new hardware purchased by UI and the Idaho National Laboratory (INL). The

transition to NKN took all of 2012. USGS provided limited support for FRAMES until the end of the 2012 calendar year.

In 2012 FRAMES began to charter the future in a new strategic plan, covering the time period 2013-2017. Until and unless further integration within existing wildland fire federal programs occurs, FRAMES development and management is guided by the FRAMES Strategic Plan (2007-2012). The Plan identifies programmatic and organizational goals that emphasize six principal areas of effort including:

1 Text is from the FRAMES Strategic Plan 2007-2012.

2 Quote is from the Wildland Fire Science Partnership Charter 2009.

3 Goals are taken from Wildland Fire Science Partnership Charter 2009.

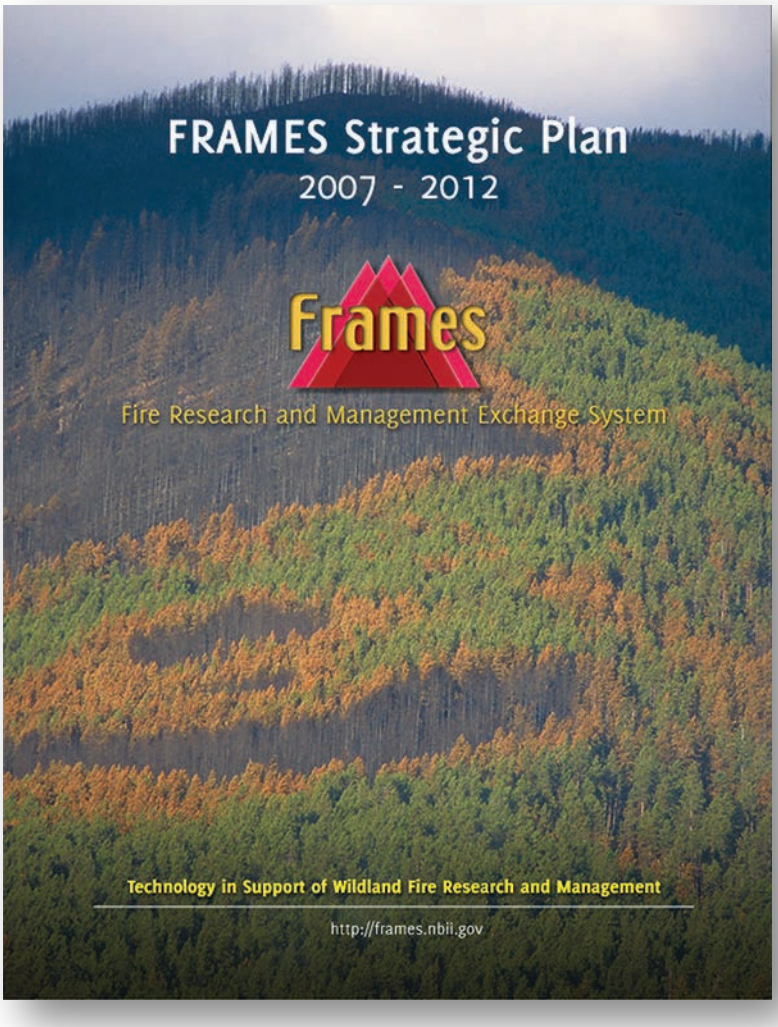


Figure 1. Strategic Plan

Goals

Programmatic Goals

1. Provide Content and Increase Content Utility. Develop a rich and usable base of content that is useful to wildland fire and natural resource professionals and policymakers.

2. Expand Services and Increase User Base. Identify opportunities to work with wildland fire and natural resource professionals (i.e., managers, practitioners, and researchers) to develop customized services that are complementary with the FRAMES informatics architecture and that target their common technology transfer and science delivery needs.

3. Increase Name Recognition and Program Awareness: Develop marketing materials for outreach and cultivate relationships with agencies and potential FRAMES users and contributors.

4. Maintain and Upgrade the Infrastructure. Build a technological infrastructure that can support wildland fire and fire-related informatics.

Organizational Goals

5. Ensure Financial Support. Determine staffing requirements and develop a sustainable system of financial support to ensure that FRAMES remains viable.

6. Provide Responsive Governance and Management. Establish a long-term plan for governance and accountability for the management and implementation of FRAMES.

This report summarizes activities and accomplishments for the calendar year of 2012. Additional details about FRAMES can be found at www.frames.gov.

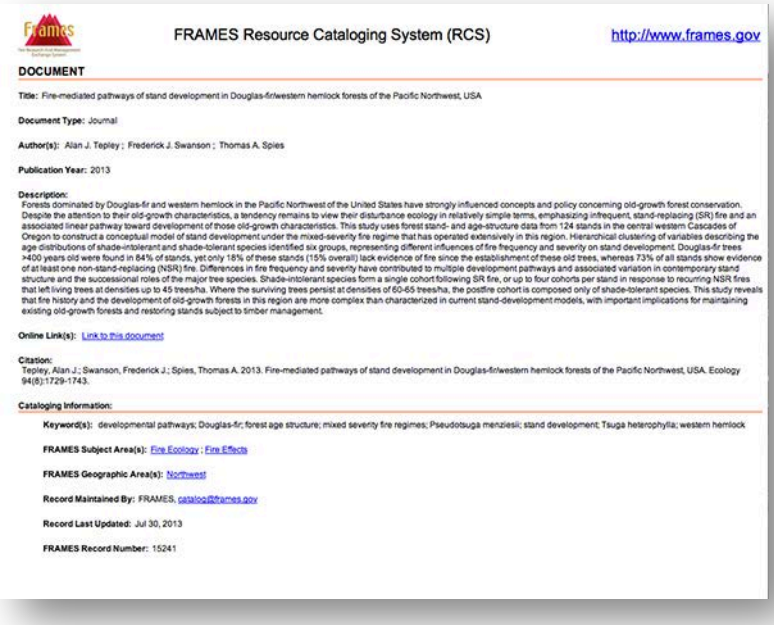
CONTENT: Resource Cataloging System (RCS)

Overview

FRAMES continues to expand and provide content to managers and researchers with the goal of making the content easier to find, access, distribute, compare, and use. Over the years FRAMES has made a significant investment in developing a comprehensive standards-based system of cataloging called the Resource Cataloging System (RCS). Version 2.0 (RCS v2) has been in operation since 2008. Its use is currently limited to FRAMES staff, as it was developed for "in-house" use rather than for release to other content providers. FRAMES staff continue to work with researchers and managers to make sure that 1) new content is properly cataloged and 2) appropriate edits are made to existing content. During 2010, FRAMES contracted with the Science Applications International Corporation (SAIC), then proceeded to work with SAIC during 2011 to develop the specifications for Version 3.0 (RCS v3). Currently, the development of RCS v3 is scheduled to be performed by FRAMES and NKN staff during 2013 and 2014. RCS v3 will enable all FRAMES partners to directly contribute content to the system. They will be able to create and edit records. Online help and tutorials will be available for partners to get answers to their questions and learn at their own pace how the catalog system works.

Figure 2. Online cataloging record review screen

The FRAMES RCS is a tool for wildland fire and other natural resource professionals to access information cataloged about wildland-fire related resources, and also to enter/catalog resources. Currently the catalog entry interface (RCS v2) is restricted to FRAMES Staff, but partners may request access to the system and once trained, select individuals may use the RCS v2. In the RCS there are six resource groups: Projects, Tools (including models), Documents, Web Pages, Data, and Programs (organizations). We have also started to catalog videos and webinar recordings, which will form the foundation of a 7th "Media" resource group in RCS v3. The RCS, particularly the information about documents and data, is based upon established metadata standards, and in the next version (RCS v3) users will have the ability to export records in formats following metadata standards such as Dublin Core (web metadata standard), Federal Geographic Data Committee (FGDC, spatial metadata standard), and Machine-Readable Cataloging (MARC, a bibliographic standard). Additional "data" metadata standards are under consideration for inclusion. By developing a cataloging system that integrates information about multiple types of resources (e.g., broader than just publications or datasets), we are able to provide information about relationships between resources, such as when a project produces a tool, is described by a document, and its associated dataset, etc. Each of these records can be related to one another.


FRAMES Resource Cataloging System (RCS) http://www.frames.gov

DOCUMENT

Title: Fire-mediated pathways of stand development in Douglas-fir/western hemlock forests of the Pacific Northwest, USA

Document Type: Journal

Author(s): Alan J. Tepley ; Frederick J. Swanson ; Thomas A. Spies

Publication Year: 2013

Description:
Forests dominated by Douglas-fir and western hemlock in the Pacific Northwest of the United States have strongly influenced concepts and policy concerning old-growth forest conservation. Despite the attention to their old-growth characteristics, a tendency remains to view their disturbance ecology in relatively simple terms, emphasizing infrequent, stand-replacing (SR) fire and an associated linear pathway toward development of those old-growth characteristics. This study uses forest stand- and age-structure data from 124 stands in the central western Cascades of Oregon to construct a conceptual model of stand development under the mixed-severity fire regime that has operated extensively in this region. Hierarchical clustering of variables describing the age distributions of shade-intolerant and shade-tolerant species identified six groups, representing different influences of fire frequency and severity on stand development. Douglas-fir trees >400 years old were found in 64% of stands, yet only 18% of these stands (15% overall) lack evidence of fire since the establishment of these old trees, whereas 73% of all stands show evidence of at least one non-stand-replacing (NSR) fire. Differences in fire frequency and severity have contributed to multiple development pathways and associated variation in contemporary stand structure and the successional roles of the major tree species. Shade-intolerant species form a single cohort following SR fire, or up to four cohorts per stand in response to recurring NSR fires that left living trees at densities up to 45 trees/ha. Where the surviving trees persist at densities of 60-65 trees/ha, the postfire cohort is composed only of shade-tolerant species. This study reveals that fire history and the development of old-growth forests in this region are more complex than characterized in current stand-development models, with important implications for maintaining existing old-growth forests and restoring stands subject to timber management.

Online Link(s): Link to this document

Citation:
Tepley, Alan J.; Swanson, Frederick J.; Spies, Thomas A. 2013. Fire-mediated pathways of stand development in Douglas-fir/western hemlock forests of the Pacific Northwest, USA. Ecology 94(8):1729-1743.

Cataloging Information:

Keyword(s): developmental pathways; Douglas-fir; forest age structure; mixed severity fire regimes; Pseudotsuga menziesii; stand development; Tsuga heterophylla; western hemlock

FRAMES Subject Area(s): Fire Ecology ; Fire Effects

FRAMES Geographic Area(s): Northwest

Record Maintained By: FRAMES, catalog@frames.gov

Record Last Updated: Jul 30, 2013

FRAMES Record Number: 15241

Figure 3. Example of a record display page

There are four main components to the RCS: 1) online Resource Cataloging Tool; 2) Resource Catalog Database; 3) record display pages; 4) search/browse functionality. Information is entered into the catalog through the Resource Cataloging Tool. Information about a resource is entered through the online user interface to create a record for that resource. Controlled terms, such as Subject Areas (synonymous with Topic on the main website), Geographic Areas (synonymous with Region), Partner Sites,

and Collection are associated with each record, as well as other uncontrolled Key Words. And as appropriate, spatial bounding box coordinates can be entered for a record.

In RCS v2, data from certain key fields in the Resource Catalog Database (a Microsoft SQL Server 2008 database) are exported nightly in order to generate, modify, or delete html pages (display records) based on cataloging activity from that previous day. Data from certain fields tagged within each record are then crawled (nightly, as well) into search indices developed by FRAMES staff, utilizing the DBSight database search platform. These indices can then be searched by clicking on the Search tab near the upper right of most FRAMES pages, or browsed by topic or region (look for the "Cataloged Resources" tab midway down the Topic and Region pages)

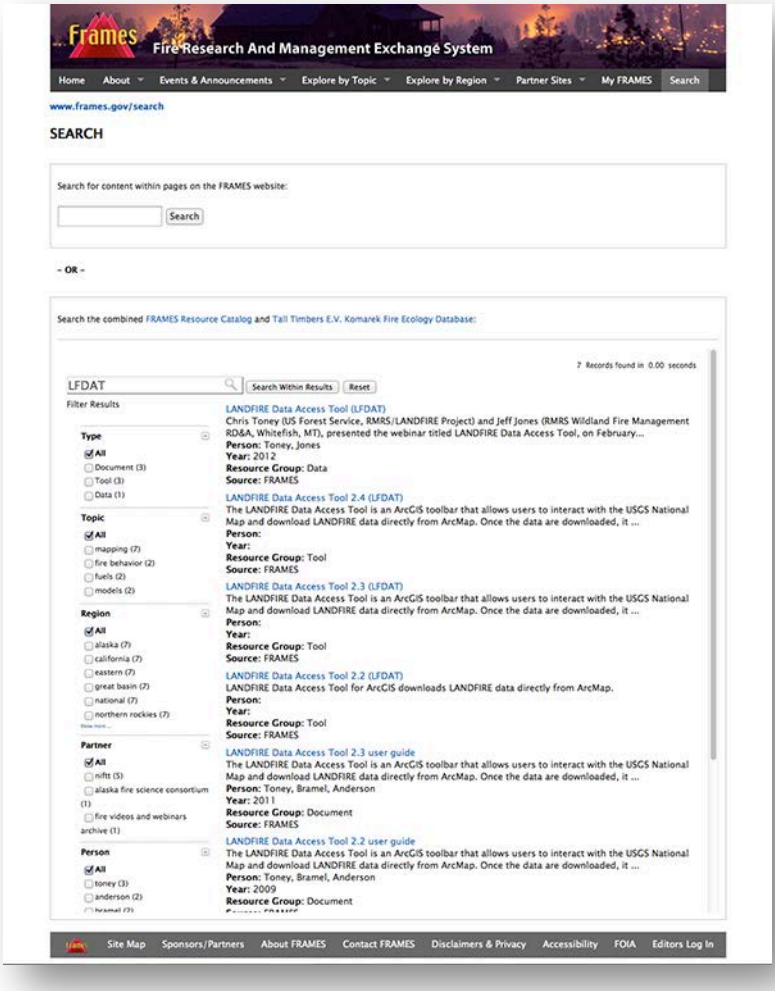


Figure 4. Search results screen for "LFDAT records"

RCS Update, Status, and Next Steps

Fundamental RCS v2 infrastructure changes occurred during 2012. First, a new search and query interface was developed and implemented in conjunction with the overall FRAMES website move to the concrete5 content management system on UI servers during the spring of 2012. Prior to July 2012, RCS v2 was developed and maintained by NACSE (Northwest Alliance for Computation Science & Engineering) through a Research Joint Venture Agreement with Oregon State University. The NACSE-hosted components of RCS v2 (the online Resource Cataloging Tool, the Resource Catalog Database, and the record display pages) were transferred to UI, where they are served from local servers and supported by onsite staff. Additional plans for RCS v2 during 2013 include improving the functionality of the search and browse interface and providing an advanced search function that includes a map interface.

As described earlier, specifications for RCS v3 were developed through a contract with SAIC. RCS v2 has been reasonably dependable and we expect to continue to use it to catalog resources until RCS v3 is constructed. Construction of RCS v3 is expected to begin sometime during 2013 in collaboration with NKN staff. Numerous improvements are planned, including a more user-friendly online cataloging tool that will incorporate a cataloging management hierarchy and workflow. This will allow a topic, partner or regional content manager to designate a number of catalogers that would submit records to them for review. The content manager would then either determine whether the record will be published, returned for improvement, clarification, etc. All of the cataloger access permissions would be administered through an integrative user account management system that will be used by FRAMES and others.

As during other years, much of the effort dedicated to the RCS during 2012 was related to the ongoing cataloging of resources suggested by FRAMES partners and users, and also resources identified by FRAMES staff, which included scanning numerous journals and a variety of agency and university fire research websites. Additionally, a more comprehensive effort was initiated to periodically review the Joint Fire Science Program (JFSP) and its associated regional consortia websites and catalog project deliverables and other relevant content as they come online.

RCS Metrics

During 2012, more than 2000 records were added to the FRAMES Resource Catalog Database. At the time of this report (May 2013), the database contains a total of 13,402 publicly accessible records -- 282 projects, 161 tools, 12,421 documents, 267 videos/webinars, 158 web pages, 109 datasets, and 4 programs.

CONTENT: FRAMES Homepage

Overview

The FRAMES Home page provides an overview of content and collaboration services provided through FRAMES. Specifically, it describes how content display is structured (by accessing topic areas, geographic regions, and partner websites). It also provides access to announcements regarding current job postings, upcoming conferences, training opportunities, and other general activities that are of interest to wildland fire and natural resource professionals. From the home page users can link to MyFRAMES, where they can access a suite of collaboration services. The home page is also used to highlight new partner activities, resources, and provide access to their websites. Additionally, users can select the Search tab from the home page to search the FRAMES website and access content in the FRAMES RCS.

Homepage Revisions

The FRAMES Home page was redesigned in conjunction with the overall FRAMES website move to the concrete5 content management system on UI servers during the summer of 2012.

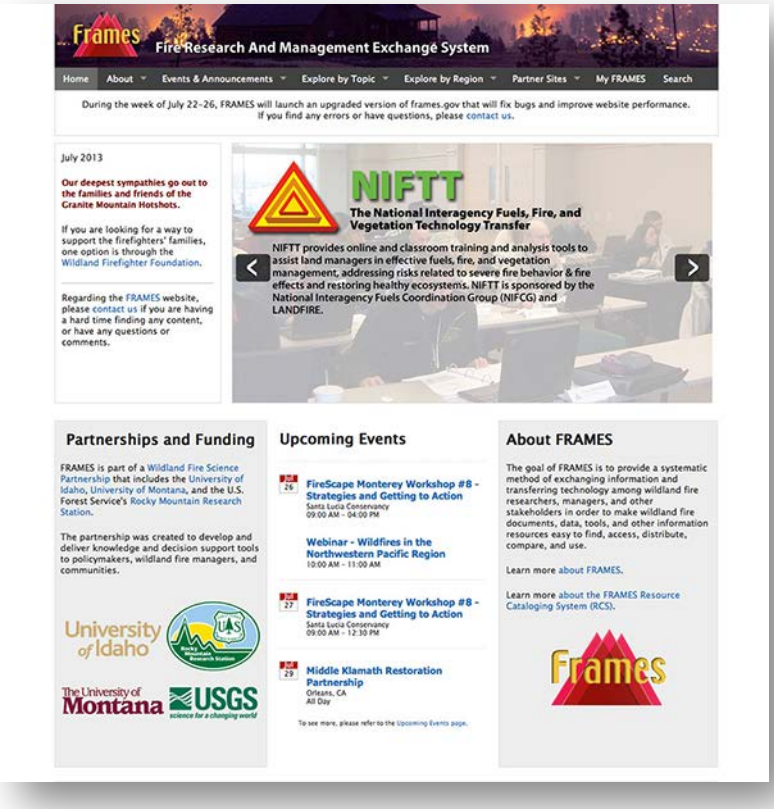


Figure 5. The FRAMES Home page

CONTENT: Topic Areas

Overview

FRAMES topic areas contain information relevant to topics of interest within the wildland fire community. Currently, FRAMES identifies 26 topics reflecting categories originally proposed by wildland fire researchers and as part of a draft of the National Wildland Fire Enterprise Architecture developed by the National Wildland Fire Coordinating Group (NWCG). The goal of FRAMES is to have the topic areas be collaborative spaces for content providers and content users, managed by subject matter experts. Two topic areas are currently being managed by subject matter experts (emissions and smoke, fire history), and two topic areas receive occasional content input directly from partners (fire behavior, fuels). The remaining topic areas provide access to standardized content (events, announcements, and cataloged resources) targeted to the topic area. Related FRAMES partner pages are also linked to the various topic areas.

The current topic areas are: administration, aviation, climate, communications, economics, emissions & smoke, fire behavior, fire ecology, fire effects, fire history, fire occurrence, fire prevention, fuels, hazard & risk, intelligence, logistics, mapping, models, monitoring & inventory, outreach, planning, prescribed fire, regulations & legislation, restoration & rehabilitation, safety, and weather

Proposed topic areas include: aquatic, and social sciences.

Update

During 2012, FRAMES continued to provide web support for the Emissions and Smoke Portal developed by the NWCG Smoke Committee (SmoC) (www. frames.gov/smoke), including the Smokepedia interactive glossary. Representatives of the NWCG Smoke Committee actively manage the emissions and smoke subject area pages and content. Ongoing activities related to the topic areas included posting events and announcements targeted to the various topic areas, as well as cataloging relevant resources.

Topic Areas Next Steps

Efforts are ongoing to partner with subject matter experts willing to assume the role of content manager for each topic area.

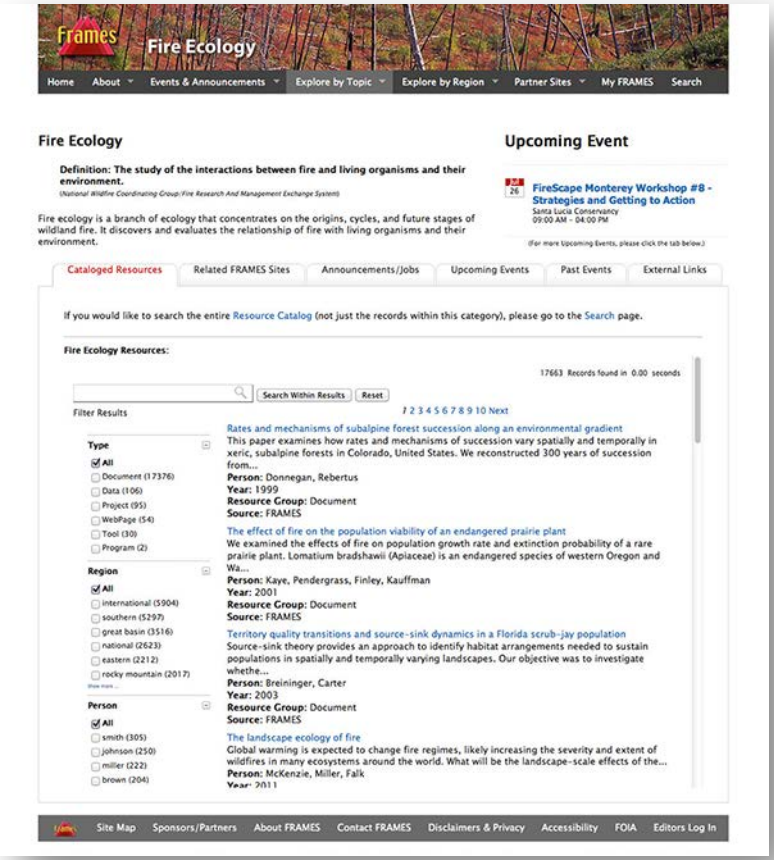


Figure 6. Fire Ecology Topic Area Homepage

CONTENT: Geographic Regions

Overview

Within the FRAMES Geographic Regions, wildland fire content is aggregated at a geographic level relevant to wildland fire management. The FRAMES Geographic Regions correspond to the boundaries of the 11 Geographic Area Coordinating Centers (GACC) designated by the National Interagency Fire Center (NIFC). FRAMES has combined the California North Ops GACC and the California South Ops GACC into the California Fire Portal, and combined the West Basin GACC and the East Basin GACC into the Great Basin Fire Portal (resulting in 9 geographic area fire portals). Therefore the nine fire portals on FRAMES are: Alaska, California, Eastern, Great Basin, Northern Rockies, Northwest, Rocky Mountain, Southern, and Southwest. Each FRAMES regional fire portal provides an opportunity for collaboration between researchers and managers

located within that particular region. FRAMES is working with regional researchers and managers (including some of the JFSP Regional Consortia) to provide access to geographically- based and nationally relevant data, documents, and tools. The regional portals provide access to standardized content (events, announcements, and cataloged resources) targeted to the region. Related FRAMES partner pages are also linked to the various regional portals, and links to relevant external websites are also provided (including highlights for the JFSP consortia relevant to the region).

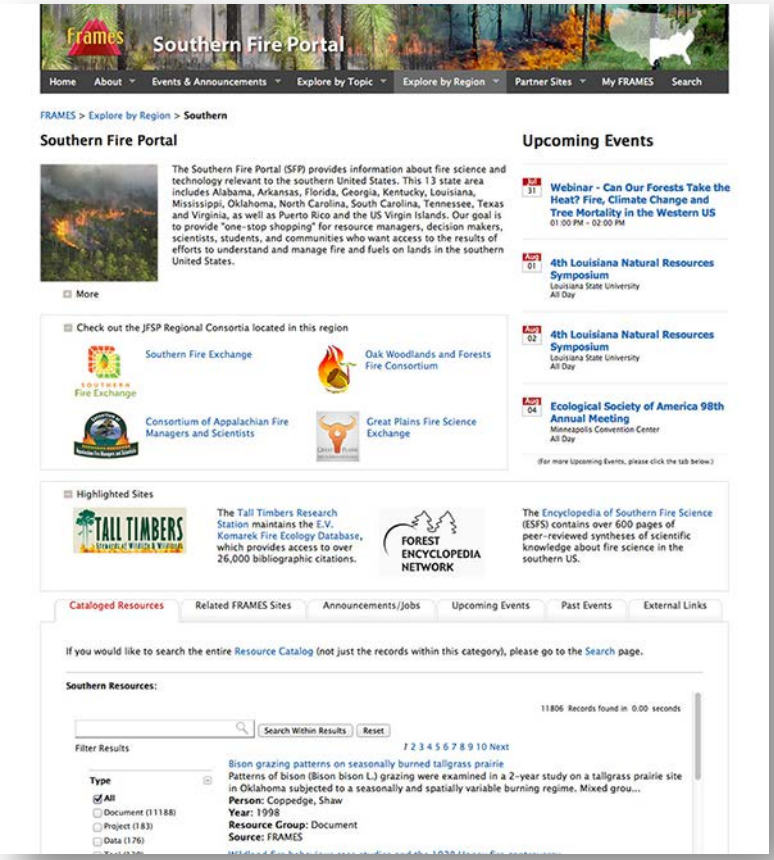


Figure 7. Southern Fire Portal home page

Update

During 2012, FRAMES continued to provide web support for the JFSP-funded Alaska Fire Science Consortium (AFSC; http://akfireconsortium.uaf.edu) and the Southern Rockies Fire Science Network (SRFSN; www.srockiesfsn.org). FRAMES also continued to provide the Southwest Fire Science Consortium (SWFSC) with customized access to the RCS

(www.frames.gov/swfsc_searches) and also archived lessons learned videos developed by the SWFSC. FRAMES content specialists continued to scan the other JFSP regional consortia websites to catalog relevant resources and post events and announcements. FRAMES continued its partnership with the Tall Timbers Research Station (TTRS), a key Southern Fire Exchange (SFE) partner, by providing access to the E.V. Komarek Fire Ecology Database (www.frames.gov/ttrs).

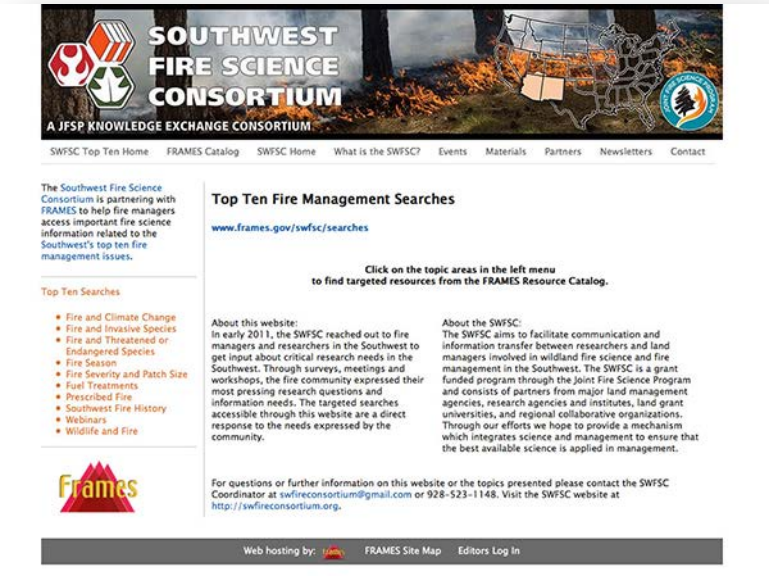


Figure 8. SWFSC Top Ten Fire Management Science Searches home page

CONTENT: Partner Sites

Overview

FRAMES provides web hosting and other services to our partners in an ongoing relationship. These services may include one or any combination of the following: 1) hosting a public site, 2) hosting an online collaboration community (login required), 3) hosting an application, database, tool, data, or other text based document, and 4) metadata management for partner resources. FRAMES also provides consultation, portal support, web design, marketing support, and online training services for partners.

Update

With the move of the FRAMES website to concrete5 in 2012 and more flexibility regarding webpage layout and design, we seized the opportunity to overhaul and reorganize content on several partner, topic, and geographic region pages. For example, we previously hosted websites for the Alaska Fire Science Consortium and the Southern Rockies Fire Science Network in our Geographic Regions Portal, and they are now listed as partners. The Emissions & Smoke Portal was also added as a partner in 2012 (it was previously located solely under topic areas). FRAMES added three new partners in 2012 – Applied Fire Behavior, the Extreme Fires Portal, and FIRESEV. The following list describes 19 partners using FRAMES to host their public websites.

Alaska Fire Science Consortium (AFSC) – A JFSP regional consortium formed to promote communication between managers and scientists and to provide a science delivery platform.

Applied Fire Behavior – Publications related to wildland fire behavior and fire danger rating authored or co-authored by Dr. Martin E. Alexander.

Assessing Burn Severity (ABS) -- JFSP funded the Rapid Response project "Assessing the Causes, Consequences and Spatial Variability of Burn Severity" to be conducted during and after active fire incidents. The project's goal was to investigate the spatial variability in fire effects and to explore relationships between burn severity and fuels, fire behavior, local weather, and topography.

Emissions & Smoke Portal – Partner-sponsored site providing access to information about smoke and emissions from wildland fire, including the online Smoke Management and Air Quality for Land Managers online tutorial.

Extreme Fires Portal – The Extreme Fires Portal is a source of information about the ongoing NASA-funded research project "Quantifying the characteristics and investigating the biogeoscientific and societal impacts of extreme wildland fires in the United States northern Rockies region."

FEAT / FIREMON Integrated (FFI) - www.frames.gov/ffi - FFI is a monitoring software tool designed to assist managers with collection, storage, and analysis of ecological information. It was constructed through a complementary integration of FEAT and FIREMON.

Fire and Fire Surrogates (FFS) Study - www.frames.gov/ffs - FFS was a national JFSP study to assess the effects of fire and fire surrogate fuel treatments. The goal was to quantify the costs and ecological consequences of alternative fire and fire surrogate restorative treatments in a number of forest types and conditions in the United States. Priority was given to forests with low to moderate severity natural fire regimes.

Fire History Analysis and Exploration System (FHAES) - www.frames.gov/fhaes - FHAES is the result of an effort to redevelop and enhance components of the FHX2 computer program, originally a DOS-based program considered to be the standard for fire history analysis. FHAES is a web-based design that is user- friendly and easily accessible to a broad range of users.

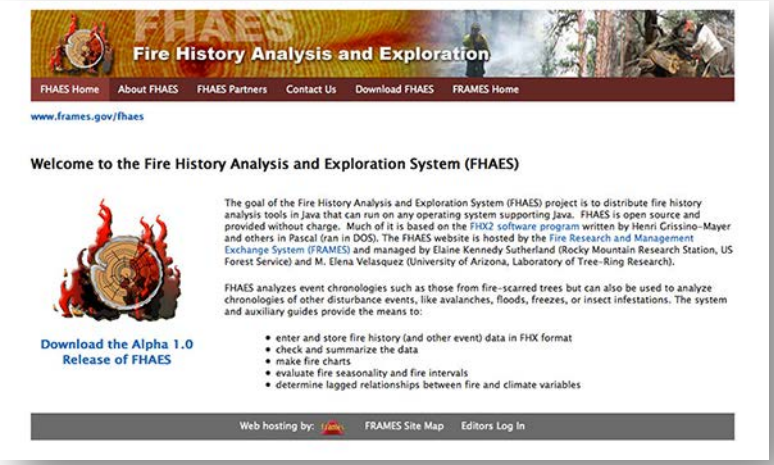


Figure 9. FHAES partner page

Fire Effects Monitoring and Inventory Protocol (FIREMON) - www.frames.gov/firemon - FIREMON is an agency independent plot level sampling system designed to characterize changes in ecosystem attributes over time. FIREMON has been integrated with the National Park Service Fire Ecology Assessment Tool into a new monitoring tool called FFI. FIREMON will still be supported but further development and updates may be suspended.

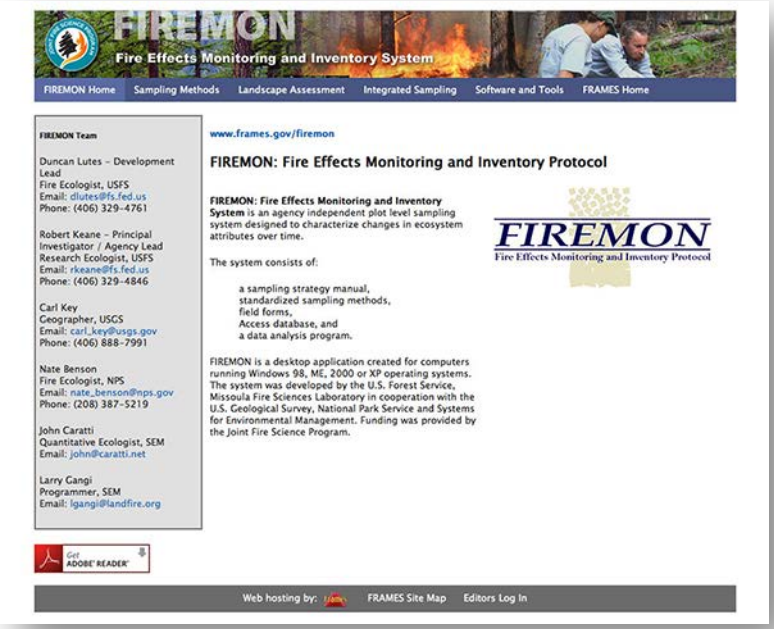


Figure 10. FIREMON partner page

FIRESEV – The Fire Severity Mapping System Project (FIRESEV) provides fire managers with critical information about the potential ecological effects of wildland fire at multiple levels of thematic, spatial, and temporal detail.

Fire Videos and Webinars Archive – FRAMES is cataloging and archiving videos, webinars, and other presentations hosted by its various partners, including the Wildland Fire Science Partnership, the Wildland Fire Lessons Learned Center, Joint Fire Science Program regional consortia, and the International Association of Wildland Fire.

Fire Regime Condition Class (FRCC) - www.frcc.gov - FRCC is an interagency, standardized tool for determining the degree of departure from reference condition vegetation, fuels, and disturbance regimes. Assessing FRCC can help guide management objectives and set priorities for treatments.

Human Dimensions and Fire Social Sciences (HDFSS) - www.frames.gov/hdfss - The goal of HDFSS is to provide social science fire managers can use. Teams of scientists and fire managers find and synthesize the best available social science and apply it to fire management. The teams then deliver the results in applications and tools designed by fire science users and researchers working together to create useful knowledge in forms that make sense to fire managers.

IFTDSS – The Interagency Fuels Treatment Decision Support System (IFTDSS, www.frames.gov/iftdss) is a framework that organizes and makes available numerous models through a single online interface.

JFSP Biomass Review - www.frames.gov/jfsp/biomass_review - This site was developed to showcase the results of the JFSP-funded project "A Review of Available Economic and Financial Biomass Information and Tools for Federal Land Managers in the West." The Review provides a synthesis of information products available to federal land managers to enhance their ability to understand and deal with the economic and financial aspects of woody biomass removal as a component of fire hazard reduction treatments.

National Interagency Fuels Technology Transfer (NIFTT) – www.niftt.gov - NIFTT is chartered by NIFCG. NIFTT assists NIFCG in fulfilling its purpose of developing and implementing an effective interagency fuels management program to address risks related to severe fires in wildland-urban interface communities and to restore healthy ecological systems in other wildland areas. NIFTT and FRAMES continue to work closely together and leverage staff from each program with the goal that NIFTT-FRAMES are one in the same from the point of view of USFS upper management, and especially with regards to the RMRS Wildland Fire Management RD&A Program and the USFS Rocky Mountain Research Station Science Application and Integration Program (SA&I).

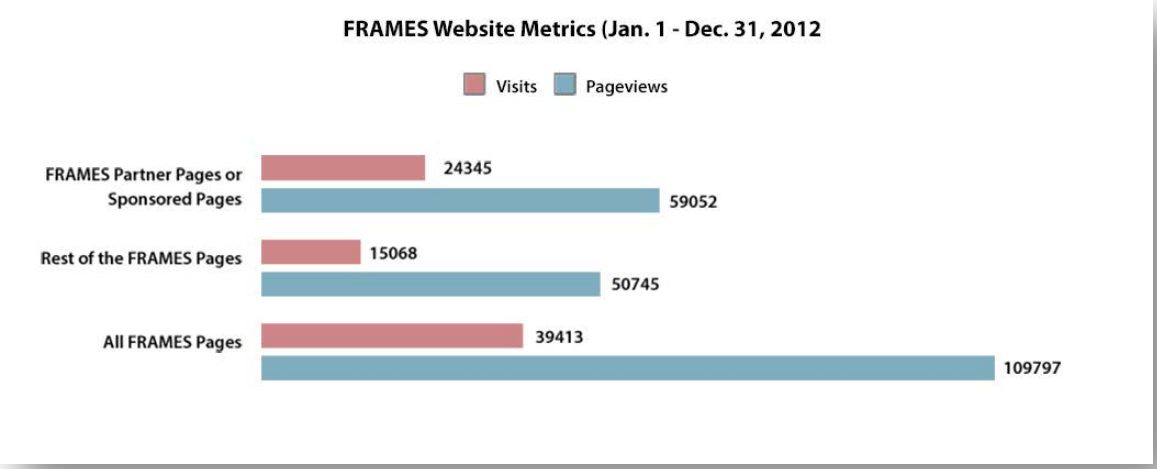
Northern Rockies Climate and Fire (NRCF) – The goal of this JFSP-funded project was to identify the past, present, and future climate drivers of regional fire and fuel dynamics in the Northern Rockies.

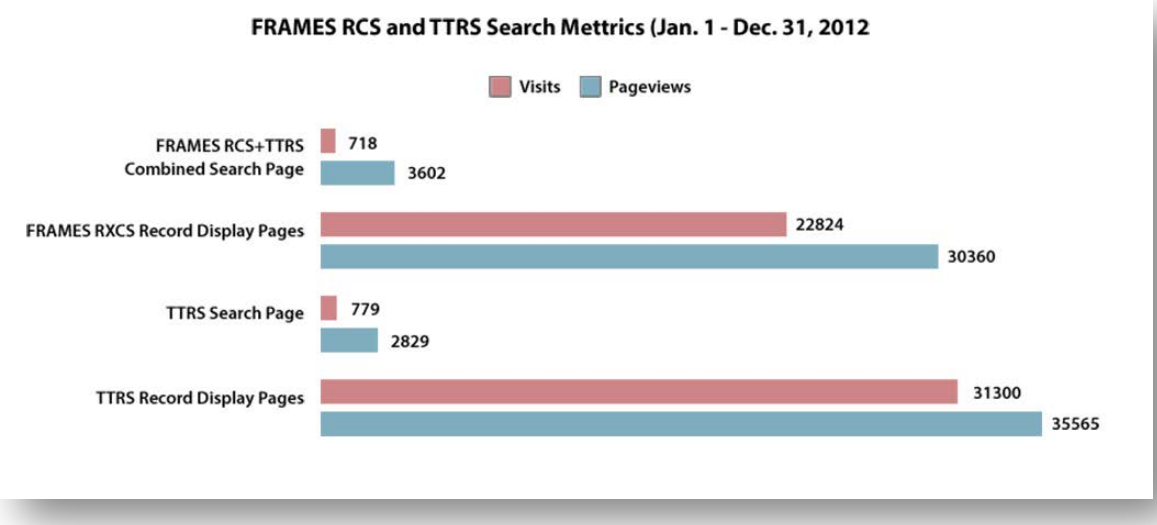
SERDP Biomass Emission Factor Database - www.frames.gov/serdp-befd - The Strategic Environmental Research and Development Program (SERDP) is supporting the RMRS and the USFS Pacific Southwest Research Station (PSW) in the development of a database that contains emissions information related to prescribed burning. The database currently contains emissions information from over 300 burns of different wildland vegetation types, including grasslands, shrublands, woodlands, forests, and tundra.

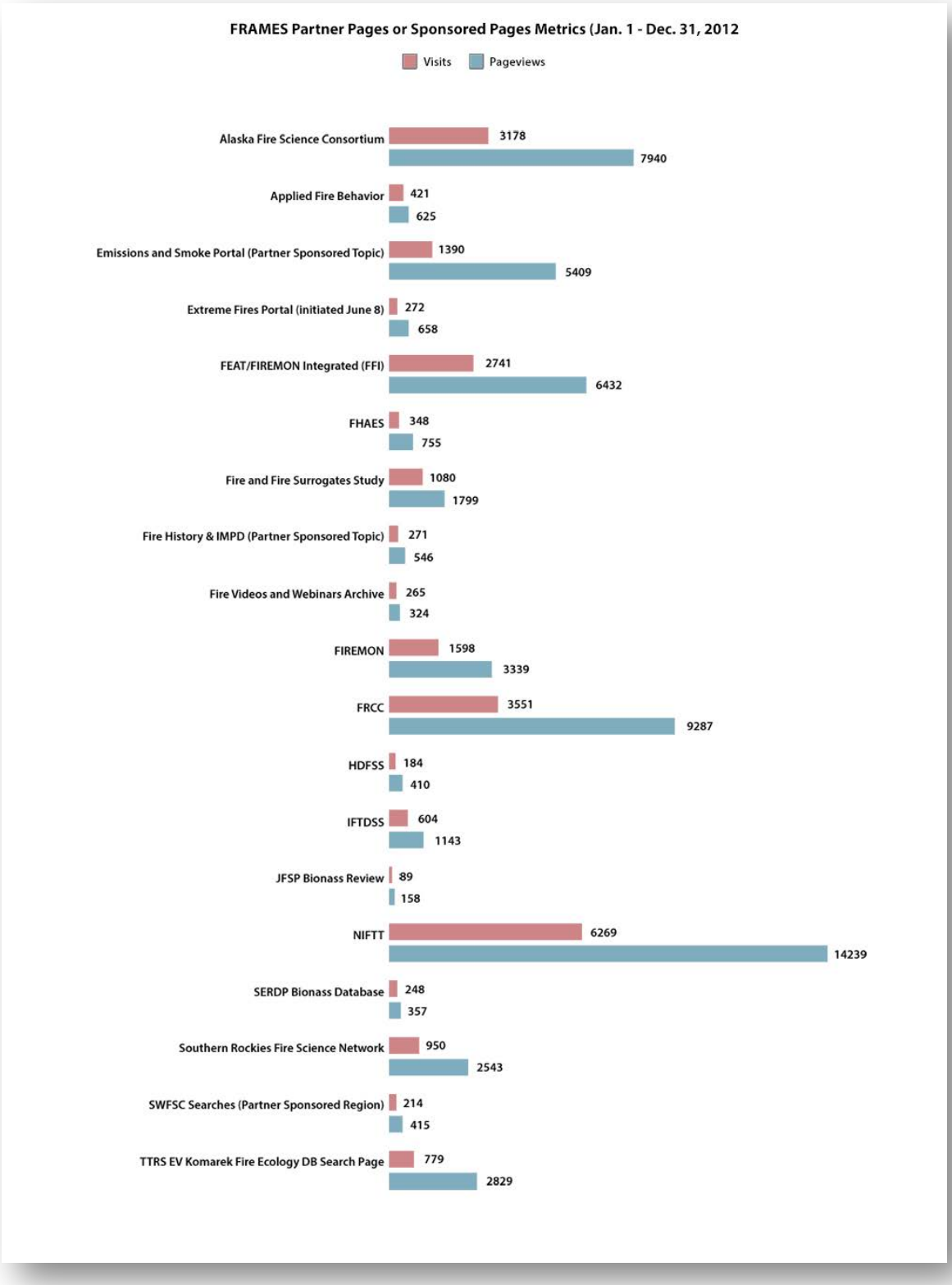
Southern Rockies Fire Science Network (SRFSN) - This JFSP-funded regional consortia was formed to facilitate collaboration between science practitioners and communities of science information users in Colorado and Wyoming.

CONTENT: Website Analytics

As outlined in the FRAMES Strategic Plan, metrics are an important part of tracking the growth and utility of FRAMES. The following information was collected from January 1 – December 31, 2012.






FRAMES Partner Pages or Sponsored Pages Metrics (Jan. 1 - Dec. 31, 2012
Visits
Pageviews
Alaska Fire Science Consortium
3178
7940
Applied Fire Behavior
421
625
Emissions and Smoke Portal (Partner Sponsored Topic)
1390
5409
Extreme Fires Portal (initiated June 8)
272
658
FEAT/FIREMON Integrated (FFI)
2741
6432
FHAES
348
755
Fire and Fire Surrogates Study
1080
1799
Fire History & IMPD (Partner Sponsored Topic)
271
546
Fire Videos and Webinars Archive
265
324
FIREMON
1598
3339
FRCC
3551
9287
HDFSS
184
410
IFTDSS
604
1143
JFSP Bionass Review
89
158
NIFTT
6269
14239
SERDP Bionass Database
248
357
Southern Rockies Fire Science Network
950
2543
SWFSC Searches (Partner Sponsored Region)
214
415
TTRS EV Komarek Fire Ecology DB Search Page
779
2829

SERVICES: Communities, User Accounts, Events and Announcements

Communities

One of the valuable features FRAMES provides its partners is the ability to create collaboration communities (MyFRAMES; www.frames.gov/myframes). These communities provide users with an opportunity to work in a collaborative environment to share documents, calendars, as well as other collaboration functions. FRAMES offers this service to groups involved in fire-related projects that need a secure login environment that enables a distributed team of people to work collaboratively in an efficient manner. Some of the communities have relationships with partner sites, topic areas, or regions, while others simply serve groups of individuals as secure places to work together. Due to the expiration of the USGS's Oracle license in December 2012, the MyFRAMES collaboration space was transferred from the USGS Oracle portal to a Drupal content management system implemented on servers located at UI. During this transfer, collaboration communities and user accounts that were no longer in use were decommissioned and archived.

User Accounts

At the end of 2012, 67 MyFRAMES accounts remain. FRAMES partners and staff utilize MyFRAMES accounts to communicate, collaborate, and share information.

Events and Announcements

As a service to FRAMES partners and others in the wildland fire and natural resources communities, FRAMES posts events and announcements on our web pages. These can be about upcoming conferences, jobs, training, etc. As with cataloged records, events and announcements may also be categorized and sorted by topic area, geographic region, and partner site. From January 1-December 2012 FRAMES displayed 244 Events (50 conferences, 50 jobs, 48 trainings/Workshops, 78 webinars, and 18 meetings) and 46 announcements.

MARKETING: Materials, Presentations, Partnerships & Collaborations

Marketing Materials

FRAMES maintains a 10’ x 7’ conference booth display structure and two 48” x 24” tabletop displays for workshops and other smaller meetings. Display content is tailored according to the target event. In 2012 the FRAMES brochure, NIFTT brochure, and FRAMES bookmark were all updated and an Emissions and Smoke Portal brochure and FRAMES Fact Sheet were created.

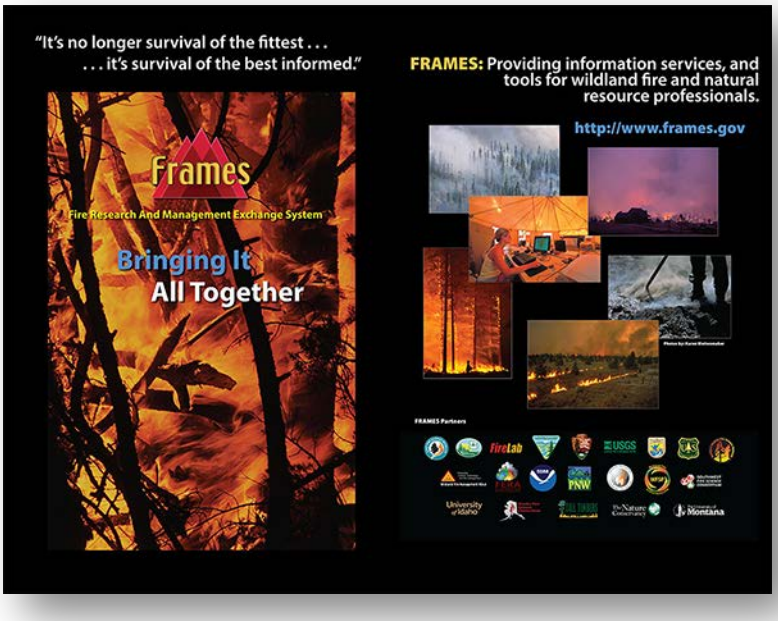


Figure 11. FRAMES 10’ x 7’ Floor Display

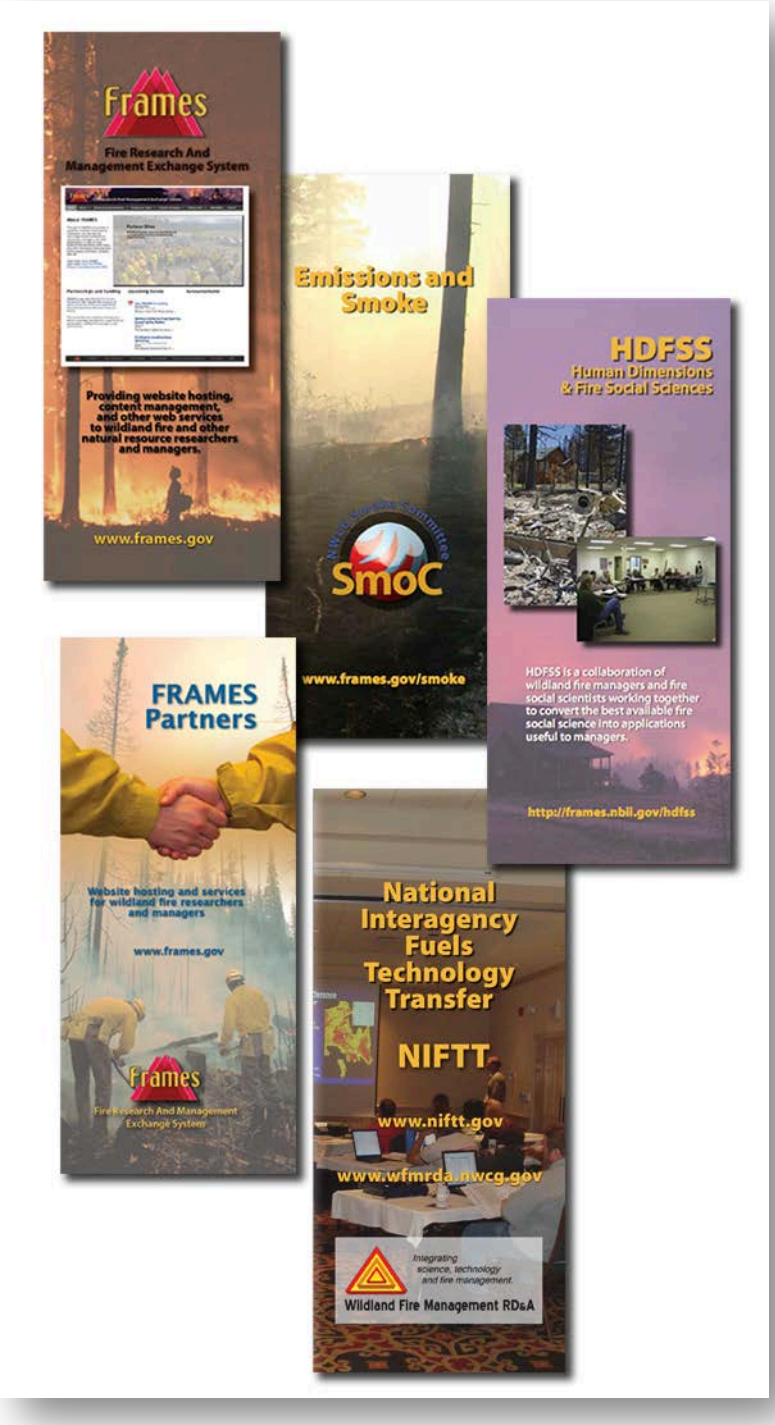


Figure 12. FRAMES and Partner Brochures

During 2012, FRAMES staff worked with partners and promoted FRAMES in meetings, workshops, and conferences throughout the year. The following is a list of events that were attended by staff.

Table 1. Events attended by FRAMES Staff in 2012

2012 Date	Venue	Description
Feb 26-Mar 2	Santa Fe, NM	AFE Southwest Fire Ecology Conference
April 17-19	Seattle, WA	IAWF 3rd Human Dimensions of Wildland Fire Conference
Aug 21-23	Missoula, MT	WFSP meeting
Oct 29-31	Seattle, WA	FRAMES/USFS meetings
Dec 2-7	Portland, OR	AFE 5th International Fire Congress

Presentations

Wells L, Olson DL, Gollberg G, Lotts K, Black J, Strand EK, (2012) FRAMES – A resource for fire science delivery and technology transfer, Poster presentation, Southwest Fire Ecology Conference, February 27-March 1, 2012, Santa Fe, New Mexico, USA.

Hyde JC, Lotts K, Wells L, Olson DL, Smith AMS, Strand EK, Gollberg G (2012) Evolving tools for smoke management education: FRAMES Emissions and Smoke Portal, Poster presentation, IAWF 3rd Human Dimensions of Wildland Fire Conference, April 17-19, Seattle, Washington, USA.

Figure 13. FRAMES poster at AFE Southwest Fire Ecology Conference, February 2012

Partnerships & Collaborations

The list below shows the diversity of partners involved with FRAMES. Numerous agencies and organizations (many not listed here) are involved with FRAMES through partner websites and/or online collaboration communities hosted by FRAMES.

Alaska Fire Science Consortium
Bureau of Land Management
CSIRO Bushfire Dynamics and Applications
FEAT/FIREMON Integrated (FFI)
Fire and Fire Surrogates (FFS) Study
Fire Effects Information System (FEIS)
Fire Effects Monitoring and Inventory Protocol (FIREMON)
Fire-Enhanced Runoff and Gully Initiation model (FERGI)
Fire History Analysis and Exploration System (FHAES)
Interagency Fuels Treatment Decision Support System (IFTDSS)
Joint Fire Science Program (JFSP)
Landscape Fire and Resource Management Planning Tools (LANDFIRE)
Montana State University Big Sky Institute
National Interagency Fuels Technology Team (NIFTT)
National Park Service
National Wildland Fire Coordinating Group (NWCG) Smoke Committee (SmoC)
NOAA Paleoclimatology Branch
Northern Rockies Fire Science Consortium
Northwest Knowledge Network (NKN)
Oregon State University Northwest Alliance for Computational Science & Engineering (NACSE)
Science Applications International Corporation (SAIC)
Southern Fire Exchange
Southern Rockies Fire Science Network
Southwest Fire Science Consortium
Tall Timbers Research Station (TTRS)
University of Alaska Fairbanks
University of Alberta
University of Arizona Laboratory of Tree-Ring Research
University of Idaho
University of Montana National Center for Landscape Fire Analysis
University of Washington
US Fish and Wildlife Service
US Forest Service
USFS Boise Aquatic Sciences Lab
USFS Missoula Fire Sciences Lab
USFS Pacific Wildland Fire Sciences Lab
USFS Rocky Mountain Research Station (RMRS)

USFS Science Application & Integration (SA&I) Program
USFS Wildland Fire Management Research, Development & Application (RD&A)
US Geological Survey Core Science Analytics and Synthesis Program (USGS / CSAS)
Wildland Fire Decision Support System (WFDSS)
Wildland Fire Lessons Learned Center (LLC)
Wildland Fire Science Partnership (WFSP)

INFRASTRUCTURE: Support, Personnel, Funding

Overview

FRAMES infrastructure encompasses the underlying technological foundation and personnel that supports the management and movement of information, communication, and tools. Since July 2012, the FRAMES hardware and software infrastructure has been hosted and maintained by the Northwest Knowledge Network (NKN), Office of Research and Development, University of Idaho in Moscow, Idaho. Responsibility to maintain FRAMES technology and content reside with NKN personnel as well as the FRAMES Staff. FRAMES is a work in progress. The total build-out of FRAMES will include: 1) a data, document, and tool repository, 2) consolidation, visualization, and web-based analytical capabilities of spatial data in a Geographic Information Systems (GIS) framework, 3) web-enabled communications and collaboration, and all of this 4) in a platform that provides for customization based upon user, community, and agency needs.

USGS / CSAS Component

The USGS / CSAS continued to support FRAMES through December 2012 as outlined in the Interagency Agreement with the US Forest Service. As described in the FRAMES 2011 Annual Report, in June 2011, the USGS announced the termination of its National Biological Information Infrastructure (NBII) Program. Due to the termination, most of the NBII infrastructure was scaled back or eliminated during the fall of 2011, and FRAMES began the transition of the website and collaboration space from USGS / CSAS to UI and NKN. The NBII website and any applications residing on the nbii.gov domain (i.e., frames.nbii.gov) were shut down on January 15, 2012 as part of the ongoing NBII Termination process. This affected several aspects of the FRAMES Program such as changing the FRAMES URL to www.frames.gov and ensuring tools, applications, documents, and web pages worked after the domain change. The FRAMES website remained on USGS servers (using the www.frames.gov domain) until June 29, 2012, when FRAMES and NKN staff completed the transfer of the main FRAMES website from

the USGS Oracle portal to the concrete5 content management system on UI servers. On Nov. 30, 2012, FRAMES and NKN staff completed the transfer of the MyFRAMES collaboration system from the USGS Oracle portal to a Drupal content management system on UI servers. Currently, the USGS / CSAS still assists with the maintenance of the www.frames.gov domain subscription, but that is the extent of current USGS / CSAS support with FRAMES infrastructure.

OSU / NACSE Component

Through June 29, 2012, version 2 of the Resource Cataloging System (RCSv2) was hosted and maintained on NACSE (Northwest Alliance for Computational Science & Engineering) servers at Oregon State University, Corvallis, Oregon. RCSv2 components were transferred to UI servers in conjunction with the transfer of the main FRAMES website. The joint venture agreement (between RMRS and NACSE) that supported the maintenance of RCSv2 expired on June 30, 2012, however, NACSE staff generously provided troubleshooting support throughout 2012 (beyond the expiration of the agreement).

University of Idaho Personnel

Eva Strand, UI College of Natural Resources, Department of Forest, Rangeland, and Fire Sciences, is the lead faculty member of FRAMES.

All FRAMES positions are contingent on continued federal funding. State Board of Education (SBOE) positions include the FRAMES Program Manager (vacant), FRAMES Project Manager (Diana Olson), and the FRAMES Content and Outreach Manager (Lynn Wells). With the June 2012 resignation of the FRAMES Program Manager (Greg Gollberg), Eva Strand became FRAMES Principal Investigator and Lynn Wells began acting as Program Operations Manager. Eva Strand is also responsible for the management and oversight of NIFTT and its relationship with FRAMES. Besides these four SBOE positions, there are four additional FRAMES staff positions. They are a full-time FRAMES Graphics & Interface Design Specialist (John Black) and three part-time FRAMES Content Specialist positions (Jennifer Lagadinos, Michael Tjoelker and Wayne Buck). Efforts were underway at the end of 2012 to hire a part-time FRAMES Web Developer/Programmer position.

Additional UI personnel who assisted with moving FRAMES from USGS to UI are Luke Sheneman, David Vollmer, and Kelly Lotts.

A staff page, including photos and biographies of FRAMES personnel and affiliated personnel, was developed in 2012 (www.frames.gov/about/frames-staff).

USGS / CSAS Personnel

During 2012, USGS / CSAS support personnel included Janice Gordon, Jeff Falgout, Jason LeBouef, Tim Woods, Julie Recker, Jennifer Carlino, Mary Macleod, Tim Mancuso, and Mike Frame.

OSU / NACSE Personnel

NACSE support personnel during 2012 included Ben Steinberg and Dylan Keon.

MSU / BSI Personnel

From January through June 2012, the Montana State University Big Sky Institute provided support personnel (Kelly Lotts) through a funding agreement with USGS / CSAS. Kelly was subsequently hired in July 2012 by UI NKN.

Funding

FRAMES continues to be funded through line item funding for the Wildland Fire Science Partnership (WFSP). This is the primary funding source for FRAMES. New funding to assume administration of the NIFTT program began at the end of 2009 and continued through 2012. FRAMES will continue to look to diversify its funding through efforts to provide custom services to new partners. FRAMES will also work with WFSP partners to increase funding to the partnership including the RMRS, UM, and UI. Also, in kind support from many organizations helps FRAMES fulfill its mission each year.

FRAMES Projects & Initiatives 2013 and Beyond

With the transfer of the FRAMES website and MyFRAMES collaboration space to the concrete5 and Drupal (respectively) content management systems complete, much of the work during 2013 will focus on continued support for existing partners, developing additional partnerships with fire research and management content providers, resource cataloging, posting events/announcements, and development of the RCSv3.

APPENDIX A: FRAMES Strategic Plan 2007-2012

FRAMES: Technology in Support of Wildland Fire Research and Management

The Fire Research and Management Exchange System (FRAMES) supports wildland fire and natural resource professionals and policymakers through an on-line informatics system. FRAMES utilizes enterprise portal technology to promote science delivery and technology transfer at a national level. Resources including data, documents, tools, notices, and web pages are publicly available through www.frames.gov. FRAMES can host resources, link to them through its cataloging system, or provide a common view of resources (e.g., databases) that are remotely distributed. Access to these resources and other content can be customized for logged in users. Logged in users create and edit content that may or may not be publicly available. A suite of collaborative services including document management and sharing, threaded discussions, project and task management, and calendars are available to content developers and other logged in users. FRAMES is a collaborative effort to produce an integrative system for connecting the tools, information, and people who are part of the enterprise of wildland fire research and management.

The University of Idaho and the US Geological Survey's CSAS program (which includes the former NBII Program) have led the development of FRAMES with guidance and support USDA Forest Service (FS), Joint Fire Science Program (JFSP), Bureau of Land Management (BLM), National Park Service (NPS) and other federal, state, and private agencies and organizations. Since 2003, FRAMES has received funding and in-kind support from many including the FS, USGS / CSAS, JFSP, BLM, NPS, NIFTT, FRCC Working Group, National, US Fish and Wildlife Service, TTRS, The Nature Conservancy (TNC), and congressional earmarks. Funding has supported three areas of development: content, infrastructure, and services. Infrastructure and content development has been emphasized with some effort spent on developing services. In 2006 there was a dramatic increase in portal traffic, logged in users, content added, partners sites hosted by FRAMES, and the use of available services. Today, FRAMES is at a crossroads between prototype and an operational system for fire informatics. This transition presents new opportunities and challenges that require additional guidance and planning.

Beginning in 2007 and for each subsequent fiscal year, a FRAMES Project Management Plan will be developed by FRAMES staff, partners, and USGS / CSAS personnel that will be reviewed by members of the FRAMES Interim Steering Committee (FISC). The FISC will continue to fill this role until such time as a permanent governance structure is established for FRAMES. Each annual plan will seek to further five year goals established in the FRAMES Strategic Plan.

FRAMES Five Year Strategic Goals

1. Provide Content and Increase Content Utility. Develop a rich and usable base of content that is useful to wildland fire and natural resource professionals and policymakers.

2. Expand Services and Increase User Base. Identify opportunities to work with wildland fire and natural resource professionals (i.e., managers, practitioners, and researchers) to develop customized services that are complementary with FRAMES informatics architecture and that target their common technology transfer and science delivery needs.

3. Increase Name Recognition and Program Awareness: Develop marketing materials for outreach and cultivate relationships with agencies and potential FRAMES users and contributors.

4. Maintain and Upgrade the Infrastructure. Build a technological infrastructure that can support wildland fire and fire-related informatics.

5. Ensure Financial Support. Determine staffing requirements and develop a sustainable system of financial support to ensure that FRAMES remains viable.

6. Provide Responsive Governance and Management. Establish a long-term plan for governance and accountability for the management and implementation of FRAMES.

FRAMES makes the following commitments to the larger community of fire policymakers, managers, researchers, and practitioners. We will be mission centered. We will continuously stay focused on our core mission, goals, and strategic actions. We will focus on excellence and undertake all activities at the highest levels of distinction. We will stay current on developments in the fire community and informatics. We will be strategic in our partnerships. We will seek to measure our progress and work with sound metrics, learn from the results, and seek improvement as a result.

APPENDIX B: FRAMES-NIFTT Partnership and 2012 NIFTT Highlights

Background

NIFTT was chartered in 2005 by the National Interagency Fuels Coordination Group to assist land managers with the assessment of fire behavior, fire effects, fire regimes, and vegetation dynamics. In July 2009, the staff of FRAMES was approached by the US Forest Service and asked to assume administration of NIFTT through an agreement between the RMRS and UI. Since October 2010, NIFTT has been operating under the Rocky Mountain Research Station (RMRS) in the Wildland Fire Management RD&A.

The FRAMES infrastructure and our relationship with the Wildland Fire Program in the UI's College of Natural Resources have benefited NIFTT specifically by 1) hosting several websites that are under NIFTT's purview; 2) providing secure logged in space for staff and stakeholders of NIFTT to collaborate on tool and training development; 3) providing tools for registering, managing, and delivering on-line courses; and 4) providing expertise in the development of on-line training courses. The purpose of the agreement is to develop comprehensive curricula of courses, workshops, help aids, and skill development tools for current fuel, fire and vegetation management applications.

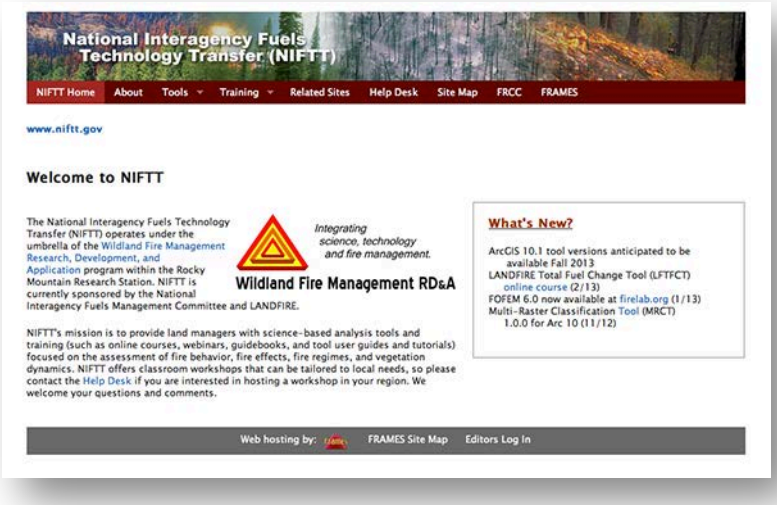


Figure 14. NIFTT partner page

Innovation

During FY2012, NIFTT released two new online courses featuring the Wildland Fire Assessment Tool and the Fire Regime Condition Class Mapping Tool; and two new online courses in the Vegetation Dynamics Learning Series, namely Predicting Vegetation

Change and Working with LANDFIRE Vegetation Dynamics Models. NIFTT released an updated version of the Fire Regime Condition Class (FRCC) online course.

All NIFTT GIS tools have been modified to be compatible with ArcGIS version 10.0 including the Area Change Tool (ACT), Fire Regime Condition Class Mapping Tool ($FRCC_{MT}$), LANDFIRE Data Access Tool (LFDAT), the LANDFRE Total Fuels Change Tool (LFTFC), and the Wildland Fire Assessment Tool (WFAT). In addition, the FuelCalc algorithms have been incorporated in WFAT to allow users to calculate post-fire fuel composition.

In FY2012 NIFTT delivered thirteen classroom workshops in conjunction with fire and fuels conferences or at regional Forest Service or interagency training session; and presented six webinars in collaboration with the Southwest Fire Science Consortium.

NIFTT outreach via their web sites www.niftt.gov and www.frcc.gov was greatly improved. These web sites, previously hosted by National Biological Information Infrastructure (NBII) on an Oracle platform, were transferred to the Northwest Knowledge Network (NKN) at the University of Idaho and are now hosted on a Concrete5 software platform. The new Concrete5 platform offers superior editing capability, download tracking, database storage, and monitoring of usage.

Cooperation

Currently, NIFTT is primarily sponsored by the Interagency Fuels Committee and LANDFIRE.

NIFTT also cooperates with:

- NWCG - help develop training material and/or post that material for S-244, S-491, and S-495.
- Washington Institute - Technical Fire Management (TFM) – provide instruction pertaining to Fire Regime Condition Class (FRCC).
- Weather Information Management System (WIMS) – develop an online course for WIMS.
- Southwest Fire Science Consortium in delivery of six webinars and two classroom workshops on the applications and use of the Fire Regime Condition Class Theory and Mapping Tool.

NIFTT partners include:

- University of Idaho – develop training materials (online courses, videos, webinars, posters, etc.), develop marketing materials, monitor the effectiveness of online courses, and provide workshop instructors.

- Fire Research And Management Exchange System (FRAMES) – host websites and miscellaneous training materials.
- The Nature Conservancy – collaborate on technology transfer of LANDFIRE products.
- RMRS Fire Modeling Institute (FMI) – collaborate on the development of FuelCalc and maintenance of FOFEM.

Inspiration (Training and User Support)

Training Materials:

NIFTT provides training opportunities using a variety of media including:

- Online courses
- Classroom workshops
- Videos
- Webinars
- Guides, tutorials, and other reference material

NIFTT currently offers online courses titled:

- Fuel Characteristics Classification System (FCCS)
- Fire Regime Condition Class (FRCC)
- Fire Regime Condition Class Mapping Tool ($FRCC_{MT}$)
- Fire Behavior Fuel Models 40 (FBFM40)
- Fuel Loading Models (FLM)
- LANDFIRE Concepts, Data, and Methods
- NOMOGRAPHS - Fire Behavior Nomographs to Estimate Fire Behavior Characteristics
- Area Change Tool (ACT)
- First Order Fire Effects Model Mapping Tool ($FOFEM_{MT}$, replaced by WFAT)
- Predicting Vegetation Change
- Working with LANDFIRE Vegetation Dynamics Models

Wildland Fire Assessment Tool (WFATIn FY2012 students registered for 243 NIFTT online courses (Table 2).

Table 2. Online student registrations for FY 2012.

Course	DOI	Other	Private	State	TNC	Univer-sity	USFS	Total
FCCS	6	0	1	1	1	2	6	17
FRCC Version 1.3	6	2	1	5	1	11	10	36
FRCCMT*	0	0	0	0	0	3	2	5
FBFM40	10	2	5	3	0	2	12	34
FLM	6	0	2	0	0	4	5	17
LANDFIRE Concepts	12	9	6	5	3	32	4	71
NOMOGRAPHS	5	3	3	1	0	4	8	24
ACT	4	0	0	0	0	1	6	11
FOFEMMT***	2	0	0	0	0	3	3	8
Predicting veg change **	2	1	1	0	1	0	1	6
LANDFIRE Models **	4	0	1	0	0	3	1	9
WFAT*	1	0	0	1	0	0	3	5
Total	58	17	20	16	6	65	61	243

* Offered in September only, ** Offered April – September, *** Offered October, 2011 – April 2012

The anonymous NIFTT course evaluations conveyed an overwhelmingly positive response from the 36 students who completed them. The most common reason for taking a course was "*to increase the efficiency on the job*", "*to help advance my career*", or "*because the topic interests me*". Students found the courses useful with 60% saying the course was "*Extremely useful*", 20% "*Fairly useful*" and the remaining 20% did not answer the question. Over 95% of the responding students thought the courses were well organized, the course length was appropriate and the rigor was appropriate. All responding students thought that the course material was relevant or very relevant. Additional comments included: "*Great course!"* and "*Great course, I have been working my through these nomographs with no help since they came out. Nice to finally get an explanation on it*."

User Support:

NIFTT provides user support by managing two websites (niftt.gov and frcc.gov) and a Help Desk that responds to question pertaining to NIFTT tools and curricula, FRCC, and LANDFIRE. Improved web page usage was implemented when the NIFTT and FRCC web sites were transitioned from the old Oracle platform to a new and improved Concrete5 (C5) platform in early June 2012.

During FY2012, the NIFTT web pages were on average visited with 1094 hits/month and the FRCC web pages were visited with 888 hits/month which is a remarkable increase from 352 hits/month for NIFTT and 393 hits/month for FRCC in FY2011.

During the time period June 1-September 30, 96% of web page visitors were from the US with 4% from other countries. Web page user tracking on the C5 platform shows that the NIFTT web site was viewed by 51% new visitors and 49% returning visitors while FRCC was viewed by 65% new visitors and 35% returning visitors.

NIFTT's Helpdesk responded to 418 requests in FY2012. In summary, approximately 54% of the requests were related to NIFTT tools and courses, 44% were related to LANDFIRE, and 2% were related to FRCC. See Table 3 for a detailed list of requests by helpdesk category.

Table 3. NIFTT Helpdesk requests for FY2012 by category.

Helpdesk Categories	# requests	% requests
Biophysical Settings (BpS)	1	0.2
FRCC BpS	1	0.2
FRCC Misc	6	1.4
FRCC software	1	0.2
LF Data Download	43	10.3
LF Data	34	8.1
LF Data Request	12	2.9
LF Misc	92	22.0
LF Refresh	2	0.5
NIFTT Misc	2	0.5
NIFTT Tools general	1	0.2
NIFTT Tool (ACT)	7	1.7
NIFTT Tool (FBAT)	3	0.7
NIFTT Tool (FRCCmt)	41	9.8
NIFTT Tool (SLA)	2	0.5
NIFTT Tool (LFDAT)	44	10.5
NIFTT Tool (Other)	13	3.1
NIFTT Tool (WFAT)	4	1.0
NIFTT training	34	8.1
Registrations and certifications*	75	17.9
Total	**418**	**100**

*The number of requests related to course registrations is less than half compared to last year's statistics because students self-registered for 9 months in FY2012.

Customer Support

- Updates and maintenance of three web sites: niftt.gov, frcc.gov, and landfire.gov. This includes a complete change of web site providers from NBII-

USGS to the University of Idaho's Northwest Knowledge Network. Both the NIFTT and FRCC web sites were completely re-built and updated in 2012.

- Installation of web traffic tracking on the NIFTT and FRCC web sites including tracking of individual documents downloads.
- Customer support via three helpdesks: helpdesk@niftt.gov, helpdesk@frcc.gov, and helpdesk@landfire.gov (418 helpdesk inquiries were responded to in FY2012)


Frames
Fire Research And Management
Exchange System